Water Management Plan

United States Environmental Protection Agency
Region 6 Environmental Services Branch

Houston Laboratory
10625 Fallstone Road
Houston, Texas 77099

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EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6 ENVIRONMENTAL SERVICES BRANCH
HOUSTON LABORATORY

WATER MANAGEMENT PLAN

Approved by:

8/5/05

Dr. Daniel Young, Facilities Manager — Date

8/15/05

Dr. Doug Lipka, Director, EPA Region 6 Laboratory — Date

8/5/05

L.C. Miner, EMS Water Team Leader — Date

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1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility-specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13123, Greening the Government Through Efficient Energy Management.

This Water Management Plan has been established to document and promote the efficient use of water at the Region 6 Environmental Services Laboratory in Houston, Texas. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines under Executive Order 13123.

2.0 FACILITY DESCRIPTION

The Houston Laboratory is staffed by the Environmental Services Branch (ESB) of EPA Region 6, Management Division. ESB provides scientific and laboratory analytical support to Region 6 programs. It provides quality assured analytical support using state-of-the-art techniques and methodology for organic, inorganic, and biological analyses. The Branch also performs technical audits of environmental monitoring laboratories and public water supply laboratories, and manages the regional contract laboratory program, including sample scheduling, sample routing, and data verification, validation, and usability. Other Region 6 functions located at the laboratory include an enforcement and compliance assurance surveillance team, an air monitoring coordinator, and Superfund Division on-scene coordinators.

The laboratory is housed in a leased facility, completed and first occupied by EPA in 1990. The 20-year lease expires in 2010. The facility is owned by DC Investments, and managed by Dienna Nelson Augustine Company. The property is located in a light industrial development, and consists of a 3.43 acre parcel with a single story laboratory building containing 39,408 square feet of conditioned space. A chemical storage building on the south side of the laboratory contains 1,108 square feet conditioned space, for a total 40,516 square feet.

3.0 FACILITY WATER MANAGEMENT GOALS

The water management goals of the Region 6 ESB Laboratory are achieved through the implementation of an Environmental Management System (EMS). The EMS is being established and implemented consistent with the laboratory environmental management policy. The laboratory environmental policy statement, as well as objectives and targets related to water consumption, are provided below.

Environmental Management Policy

Protection of the environment and of the health and safety of employees, neighbors and the general public are paramount operational considerations at EPA's Region 6 Laboratory. They are commitments of the Lab's leaders and staff who strive to fulfill that mandate through the implementation of an environmental management system (EMS) that has been designed to achieve the following specific goals:

1) Comply with applicable federal, state, and local laws and regulations
2) Strive to prevent the generation and dispersal of pollutants
3) Continually improve the EMS to improve environmental performance
4) Purchase environmentally preferable supplies
5) Manage supplies so as to minimize exposures to potential incidents
6) Periodically share environmental accomplishments with the public

All Region 6 Laboratory staff, contractors and other parties that conduct operations for the Lab onsite or offsite are subject to the commitments in this policy that has been distributed to the them and made available to the public upon request.

EMS Water Conservation Objectives

The Region 6 Laboratory has identified the reduction of water consumption demand as an environmental objective. With respect to that objective, two targets have been established. First, laboratory management intends to reduce water consumption by 3 percent by 2010 by encouraging the building owner to install flow restrictors on lavatory faucets and water-efficient toilets and urinals. Laboratory management will also encourage the building owner to introduce xeric landscaping designs, and to reduce water application rates to irrigated areas. In addition, laboratory management will actively promote water conservation awareness.

4.0 UTILITY INFORMATION

Contact Information

Potable water supply and sewer service are provided by:

City of Houston
Public Works and Engineering Department
4200 Leland
Houston, TX 77023

713-371-1400

Water Rate Schedule

The Region 6 Laboratory is billed for water use associated with a 2-inch irrigation meter that services lawn irrigation needs and a 3-inch commercial meter that provides all other facility water needs.

Irrigation meter. Monthly rate is a flat fee of $90.35 for up to 16,000 gallons and $4.35 for each additional 1,000 gallons.

Commercial meter. Monthly rate is a flat fee of $123.68 for up to 35,000 gallons and $2.58 for each additional 1,000 gallons.

The facility pays a monthly fee of $65.33 for fire water service.

Sewer Rate Schedule

Sewer service is billed based on the commercial meter utilization. Service is billed as $11.71 for the first 2,000 gallons and $4.46 for each additional 1,000 gallons. The facility receives a sewer use credit for water evaporated from the cooling tower; sewer charges are not applied to this water. The evaporated quantity is calculated as the difference between the cooling tower make-up quantity and blow-down quantity. Cooling tower make-up and blow-down quantifies are metered and monthly readings are provided to the Houston Public Works and Engineering Department by the building engineer.

Water and Sewer rates reported here are effective from 1 April 2005 to 31 March 2006.

Payment Office

Research Triangle Park Finance Center (RTP-FC)

(Pouch and Regular Mail)
Environmental Protection Agency
Mail Code - D143-02
Research Triangle Park, NC 27711

(FEDEX)
Environmental Protection Agency
Mail Code - D143-02
4930 Page Road
Research Triangle Park, NC 27711

The fax number for RTP-FC is: 919-541-4975

Point of Contact:

Mary Ann Keith (Supervisor)	919-541-3775
Kim Poteat	919-541-1468

5.0 FACILITY INFORMATION

The Region 6 Laboratory contains a mixed use of office and laboratory space. Offices occupy approximately 40 percent of the building and laboratories the remaining 60 percent. The laboratory space is configured to conduct bench-scale analyses of environmental samples for organic, inorganic, and biological constituents. Water is used for landscape irrigation, mechanical systems, sanitary needs, and laboratory processes. Additional details on facility water use are provided in the following sections.

Major Water Using Processes

Estimates of potable water consumption by major use area are provided in Table 1. These data reflect average facility water use between January 2003 and December 2004.

Table 1

Major Water Using Processes

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Irrigation water	836,000	26.5	Metered
Sanitary water	335,000	10.6	Engineering estimate
Laboratory central deionized water system	7,300	0.2	Metered
Miscellaneous laboratory water use	15,000	0.5	Engineering estimate
Water softener brine discharge	23,000	0.7	Engineering estimate
Cooling tower make-up water	1,942,200	61.5	Calculated by remaining difference from facility metered total. Separate meter on make-up line indicates from may be up to 2,290,000 gallons per year.
TOTAL	3,158,500	100	Metered

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

Measurement Devices

Incoming city water is supplied through two separate meters. One meter, designated “Lawn Meter” (account number 4327-2078-9010) measures water supplied for outdoor irrigation. The other meter, designated “Commercial” (account number 4327-0780-2026) measures all other water supplied for facility use. Both meters are located in meter boxes in the front lawn of the facility.

Flow totalizing meters are also installed on the make-up water lines to the heating water and cooling water recycle loops, and the cooling tower make-up and blow-down lines. Totals from these meters are recorded monthly by the building engineer. Unexpected changes in any of these usage rates are investigated and resolved. A flow totalizer is also installed on the air handler condensate recovery system - totals from this meter will also be recorded monthly by the building engineer under this plan. A water meter is installed on the deionized (DI) water supply system, water usage is recorded in a DI system log whenever maintenance is performed on the DI system.

Under this plan, metered usage will be tracked monthly to the EMS Water Team Leader to monitor trends in water consumption.

Shut-off Valves

Shut off valves for the building water supply is located in the mechanical room, Room 224. The shut off for the irrigation system is located at the below grade meter box.

Occupancy and Operating Schedules

Approximately 67 employees work at the Houston laboratory. The laboratory operates on a flex time schedule and is typically occupied between 6:30 a.m. and 6:30 p.m., Monday through Friday.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

FEMP has identified Water Efficiency Improvement Best Management Practices (BMPs) in 10 possible areas. Implementation of BMPs in four or more areas are required under FEMP guidance. The Houston laboratory has adopted and will maintain BMPs in five of the 10 areas, as checked below:

- ✓ Public Information and Education Programs
- ✓ Distribution System Audits, Leak Detection, and Repair
- ❑ Water-Efficient Landscape
- ❑ Toilets and Urinals
- ❑ Faucets and Showerheads
- ❑ Boiler/Steam Systems
- ✓ Single-Pass Cooling Systems
- ✓ Cooling Tower Systems
- ❑ Miscellaneous High Water-Using Processes
- ✓ Water Reuse and Recycling

Additional information related to each BMP area is provided in the following sections.

Public Information and Education Programs (BMP #1)

The Region 6 Laboratory promotes water conservation and awareness using the EPA laboratory "Every Drop Counts" water conservation poster series. Conservation posters are displayed in prominent locations throughout the laboratory. In addition, employees will be educated on water and other resource conservation topics through the implementation of the laboratory EMS, which is being developed. The reduction of water consumption has been identified as an objective under the EMS. In view of this objective, the Region 6 Laboratory management team will maintain and promote water conservation awareness though internal reports, staff meetings, e-mail and posting information.

Distribution System Audits, Leak Detection, and Repair (BMP #2)

Facility staff are trained to report leaks and malfunctioning water-using equipment to the building engineer. Any problems or leaks identified are addressed immediately. In addition, the

building engineer performs a daily visual inspection of the building mechanical room and corridors.

A screening level system review was conducted in May 2005 and known water uses account for greater than 90 percent of water consumption.

Water-Efficient Landscape

The laboratory facility maintains 1.15 acres of irrigated landscaping, primarily covered with St. Augustine grass. Planted beds of Asian jasmine and other ground cover are used to landscape the front and sides of the building.

Irrigation occurs at night, using eight zones, each controlled with a separate time clock. During dry periods, irrigation nominally occurs three to four times per week, and is manually reduced when rain occurs. The irrigation frequency and duration is established to provide the minimum quantity of water necessary to avoid the appearance of stressed vegetation.

The irrigation system is run during daylight hours once every month to inspect for damaged or malfunctioning system components. Any problems identified are immediately corrected.

BMP credit is not claimed in this area at this time. For BMP credit, the irrigation controller should be equipped with rain or soil moisture sensors that automatically prevent irrigation during periods of rainfall or when there is sufficient moisture in the ground for plant health and survival.

Toilets and Urinals

Construction of the laboratory occurred in 1989, prior to the implementation of current water-efficient sanitary fixture standards. Given the period of building construction and the part numbers of the relief valves stocked (Sloan A-19-A for toilets and Sloan A-19-AU for urinals), toilets are estimated to operate at 4.5 gallons per flush (gpf) and urinals at 1.5 gpf, rather than the current low-flow design standards of 1.6 and 1.0 gpf, respectively. A full inventory of sanitary fixtures is provided in Table 2.

Table 2

Sanitary Fixture Inventory

Fixture	Quantity	Flow Rate
Toilets	10	4.5 gpf
Urinals	3	1.5 gpf
Lavatory Sinks	13	unknown
Showers	4	unknown

Janitorial staff and employees are trained to report leaks or other maintenance problems to the building engineer, which are immediately corrected.

BMP credit is not claimed at this time, pending conversion of the toilets and urinals to water-efficient design standards.

Faucets and Showerheads

Table 2 provides an inventory of lavatory faucets and showerheads. One of the faucets in Room 199 was replaced with a water-efficient model. The remainder of the fixtures are originally installed equipment, and do not have flow restrictors. Building water pressure is maintained at approximately 32 pounds per square inch, toward the low end of the range needed for optimum system performance.

Janitorial staff and employees are trained to report leaks or other maintenance problems to the building engineer, which are immediately corrected.

BMP credit is not claimed at this time, pending installation of flow restrictors to limit lavatory faucet flow to 2.2 gpm or less and showerheads to limit flow to 2.5 gpm or less.

Boiler/Steam Systems

Boilers produce recirculating 165 degree F hot water rather than steam. No steam condensate is generated. Therefore, no BMP credit is claimed in this area.

Single-Pass Cooling (BMP #3)

No single pass cooling is used. All laboratory equipment cooling needs are supplied by point of use, air-cooled chiller units.

Cooling Tower Systems (BMP #4)

The laboratory is equipped with a two cell cooling tower, rated at 500 tons of total cooling capacity. A cooling tower maintenance contractor performs a monthly quality, performance, and water chemistry review of cooling tower operation. Chemical treatment is provided to control scale and corrosion; treatment chemical addition rates are controlled to be proportional to the quantity of water blown down. Corrosion rates are monitored using metal coupons. A conductivity meter set at 2,500 *u*S/cm is used to control blowdown. This set point results in efficient water use, as the facility achieves over 5 cycles of concentration in the cooling tower. In April 2005, the facility installed a Sonoxide™ microbiologic control system. This system kills bacteria and algae with ultrasonic waves, thus eliminating the need for chemical biocide addition. Tower packing and distribution valves were replaced in 2004.

Cooling tower make-up water and blow down quantities are metered and recorded monthly by the building engineer. These data are provided to Houston Department of Public Works and Engineering and the facility receives a sewer use credit for the water consumed by evaporation and, therefore, not sewered. In addition, recovered air handler condensate is used as

supplementary cooling tower make-up water. See the discussion under water reuse and recycling below.

Miscellaneous High Water-Using Processes

While not a particularly high water-using process, water is used to dilute acid rinse water prior to discharge. When approximately 50 to 100 gallons of acid rinse water accumulates, it is pumped to a dilution tank where approximately 2,000 gallons of dilution water are added, prior to discharge through a lime pit to the sanitary sewer system. The system is used infrequently. This use of dilution water could be eliminated if the laboratory had an acid wastewater pH control system based on chemical addition. No BMP credit is claimed in this area.

Water Reuse and Recycling (BMP #5)

The facility recovers air handler condensate for reuse as cooling tower make-up water. Condensate that forms on cooling coils in the primary laboratory air handler flows by gravity to a 300 gallon underground tank outside of the building, adjacent to the air handler room. The tank is equipped with low-level and high-level float controlled switches. When the high-level switch is activated, a pump transfers recovered condensate to the cooling tower basin. When the discharge pump is energized, sodium hypochlorite biocide is added to the condensate collection tank through a metering pump. The discharge pump is turned off when the low-level float switch is actuated. The discharge line from the condensate collection tank to the cooling tower system is equipped with a flow totalizing meter. Over 8.3 million gallons have been recovered in the 6 years since the system was installed, providing over $20,000 in water savings. The system cost approximately $5,000 to $6,000 to install in 1999.

7.0 DROUGHT CONTINGENCY PLAN

In the event of a drought or other water supply shortage, the Houston laboratory will follow the water use recommendations and restrictions of the City of Houston. Article VII of the Houston Water and Sewer Code addresses water shortages, and can be found at:

http://www.houstontx.gov/codes/codes47-6to8.pdf

The ordinance has four defined response levels. The levels and potential impact on laboratory operations are summarized below:

Stage One Water Shortage

A water information management program will be initiated during a Stage One shortage, implemented when the water supply and delivery system is under stress from lower than average rainfall, unusual temperatures, or other factors. During a Stage One shortage, customers will be **requested** to check for and repair leaks, and limit irrigation to nighttime hours, two days per week.

Stage Two Water Shortage

A Stage Two water shortage is reached when one or more of the following conditions exist: 1) reservoir storage is 24 months supply, 2) average water production exceeds 80 percent of capacity, or 3) average water pressure in the distribution system is 45 pounds per square inch, or less. During a Stage Two shortage, customers are **required** to fix detectable leaks within 72 hours, and limit irrigation to nighttime hours, two days per week.

Stage Three Water Shortage

A Stage Three water shortage is reached when one or more of the following conditions exist: 1) reservoir storage is 18 months supply, 2) average water production exceeds 85 percent of capacity, or 3) average water pressure in the distribution system is 40 pounds per square inch, or less. During a Stage Three shortage, customers are **required** to fix detectable leaks within 72 hours, and limit irrigation to nighttime hours, two days per week. Aesthetic use of water (e.g., fountains) is prohibited.

Stage Four Water Shortage

A Stage Four water shortage is reached when one or more of the following conditions exist: 1) reservoir storage is 12 months supply, 2) average water production exceeds 90 percent of capacity, or 3) average water pressure in the distribution system is 35 pounds per square inch, or less. During a Stage Four shortage, customers are **required** to fix detectable leaks within 72 hours. Irrigation, aesthetic use of water, and using water to wash down motor vehicles, boats, or exterior surfaces is prohibited.

As required, the building engineer will implement the facility response to City of Houston water use restrictions.

8.0 COMPREHENSIVE PLANNING

The Facilities Manager will ensure that water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption.

9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

The Region 6 Laboratory is considering the following projects to achieve additional reductions in water use:

1) **Upgrade Irrigation System Control.** A rain or moisture sensor will be installed on the irrigation control system so the system will not operate when existing moisture levels are adequate. Such sensors typically reduce water use by 15 to 20 percent. The laboratory currently spends $3,600 per

year for 836,000 gallons of irrigation water. A rain or moisture sensor could save $500 to $700 per year. In addition, xeriscape design will be considered in any future planned landscape restoration or improvements.

2) **Upgrade Toilets and Urinals.** The laboratory will consider upgrading toilets to water-efficient design (1.6 gallons per flush). Ten toilets could be upgraded. At an installed cost of $500 per fixture, simple payback is estimated to be 6 years at current water rates. Toilet upgrades are estimated to save 125,000 gallons and $900 per year. Urinals currently operate at 1.5 gallons per flush (gpf), close to the water-efficient design standard of 1.0 gpf. Further water savings could be obtained by converting to ultra-low flow (0.5 gpf) or no-flush designs. Water savings from urinal conversion would save between 30,000 and 40,000 gallons and $200 to $300 per year. At an installed cost of $500 per fixture, simple payback is estimated to be 5 to 8 years.

3) **Install Lavatory Faucet Flow Restrictors and Low Flow Showerheads.** Faucet flow restrictors and low flow showerheads can be installed for a few dollars each. The faucet flow restrictors are estimated to save 30,000 gallons and $200 per year, and provide payback in under 1 year.

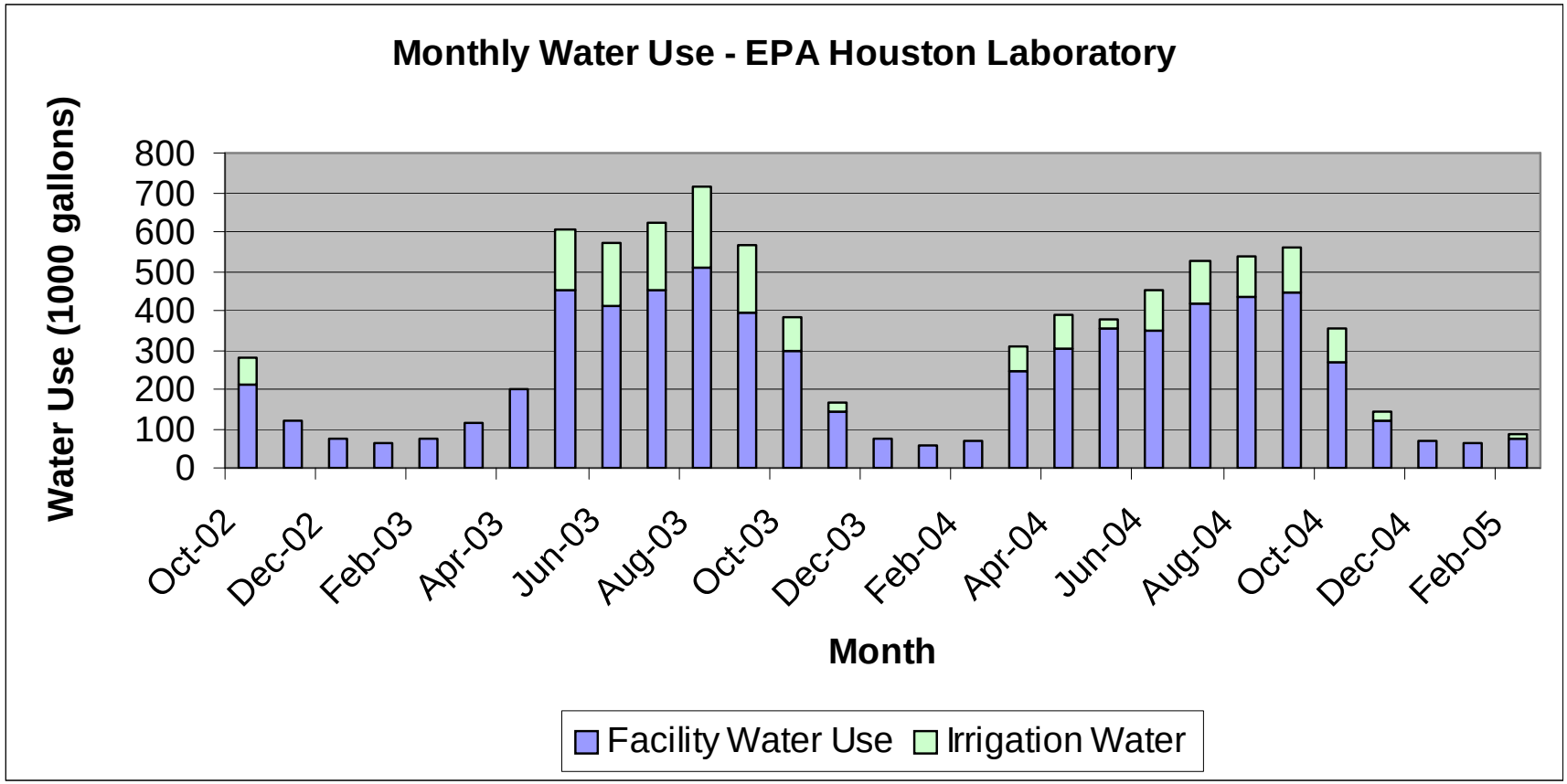
4) **Consolidate and Monitor Water Use Data.** Under the EMS, water use data will be consolidated by the EMS water team leader and usage trends evaluated. Water use data that will be assembled include metered usage recorded by the City of Houston (available from water bills), and metered usage recorded by the building engineer from internal flow meters (cooling tower make-up, cooling tower blowdown, hot water loop make-up, chilled water loop make-up, and recovered air handler condensate). Deionized water use will be obtained from the flow meter on that system. Water usage for each location will be recorded monthly and trends evaluated to monitor water usage and saving opportunities. Water bills will be examined by Region 6 Laboratory staff to ensure sewer use credits for cooling tower evaporation are being applied by the City of Houston.

APPENDIX A

WATER USE AND WATER BALANCE SUPPORTING CALCULATIONS

Region 6 ESB Laboratory, Houston, Texas

Major Process	Annual Consumption (gallons)	Supporting Calculations
Irrigation water	836,000	Based on monthly meter readings
Sanitary water	335,000	Engineering estimate calculated based on 67 people generating 20 gallons/day, 250 days per year. 67 * 20 * 250 = 335,000 gallons
Laboratory central deionized water system	7,300	Based on flow totalizer reading of 15,084 gallons for period of 11 April 2003 to 3 May 2005, normalized to one year
Miscellaneous laboratory water use	15,000	Engineering estimate. Assumed to be approximately twice the DI water use
Water softener brine discharge	23,000	Estimated at 1 percent of facility water use (does not include irrigation water)
Cooling tower make-up water	1,942,200	Calculated by difference: 3,158,500 - 836,000 - 335,000 - 7,300 - 15,000 - 23,000 = 1,942,000. Note that a meter on the make-up water line indicates make-up water use may be as much as 2,290,000 gallons per year. The differential method was used here rather than the make-up meter reading to close the water balance with the main facility water meter. Meters at both locations are routinely calibrated and the reason for the difference in meter readings is not known.
TOTAL	**3,158,500**	**Average annual usage, January 2003 to December 2004**


Monthly Water Use - EPA Houston Laboratory
Water Use (1000 gallons)
800
700
600
500
400
300
200
100
0
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
Oct-03
Dec-03
Feb-04
Apr-04
Jun-04
Aug-04
Oct-04
Dec-04
Feb-05
Month
Facility Water Use
Irrigation Water

Houston Laboratory Water Use Data
(in 1,000 gallons)

Month	Facility Water Use	Lawn Meter
Oct-02	150	64
Nov-02	119	0
Dec-02	73	0
Jan-03	65	0
Feb-03	75	0
Mar-03	115	0
Apr-03	200	0
May-03	301	151
Jun-03	247	163
Jul-03	283	171
Aug-03	301	208
Sep-03	225	169
Oct-03	216	83
Nov-03	126	19
Dec-03	73	0
Jan-04	56	0
Feb-04	69	1
Mar-04	183	62
Apr-04	219	84
May-04	328	24
Jun-04	249	100
Jul-04	307	110
Aug-04	326	107
Sep-04	333	113
Oct-04	179	87
Nov-04	101	20
Dec-04	68	0
Jan-05	61	2
Feb-05	66	10